SECTION VII

POINT SOURCE MONITORING

A. INTRODUCTION

Point sources are defined as discrete discharge sites, from which nutrients are exported in a quantity and concentration amenable to treatment or removal (Uttormark, et al., 1974). Both municipal and industrial sewage treatment plants (STPs), are typical examples of point sources. Significant quantities of nitrogen compounds (ammonia, nitrate, nitrite) and phosphorus compounds (soluble, organic and inorganic forms) are components of the treated effluent normally discharged from STPs. The point source load of nutrients may be, in itself, of sufficient magnitude to promote the growth of algae and aquatic macrophytes (Edmonson, 1972). Such loads are often recognized as important causative agents in the accelerated eutrophication of lakes and ponds.

Since point source loads eminate from discrete sites, they are more readily and easily controlled or treated than nutrients contributed from diffuse sources. Sewage diversion and advanced wastewater treatment, by physical, chemical or biological means, are but two options which can substantially decrease total point source nutrient loads to lakes. In addition, when demonstrated to be a necessary and cost effective means for the protection or maintenance of water quality, the advanced treatment of point source effluents can be legally mandated (USEPA, 1980). Thus, although point source nutrient contributions can be sizable, their discrete nature makes them a more easily managed component of a lake's nutrient budget.

All point sources within the Lake Hopatcong drainage basin that are permitted by the New Jersey Pollution Discharge Elimination System (NJPDES) were identified. The name, location, permit number, receiving stream, and measured mean flow for each point source were tabulated (Table 20).

Table 20

SEWAGE TREATMENT PLANTS WHICH DISCHARGE
INTO LAKE HOPATCONG TRIBUTARIES

Name of Plant	Location	Permit No. NPDES	Receiving Stream	Type of Treatment	Average Flow $m^3 \cdot day^{-1}$
The Consolidated School*	Route 181 Jefferson Twp., Morris County	NJ0021156	Marsh which drains into Lake Hopatcong	Extended Aeration	4
Arthur Stanlick School*	East Shawnee Trail, Jefferson Twp., Morris County	NJ0021105	Marsh which drains into Lake Shawnee	Activated sludge with sand filtration beds	9
Our Lady of the Lake School*	Dunlop Road Mt. Arlington Morris County	NJ0026239	Unnamed tributary to Lake Hopatcong	Activated sludge with sand filtration beds and dosing tank	4
Mt. Arlington Knolls Apartment,	Building 7 Henry Court Mt. Arlington Morris County	NJ0026212	Unnamed tributary approximately ½ mile upstream from Lake Hopatcong	Activated sludge with sand filtration beds and dosing tank	85

*Operates only during school year.

B. LOCATION AND DESCRIPTION OF POINT SOURCES

There are four point sources which discharge to tributaries of Lake Hopatcong. These are Arthur Stanlick School, Consolidated School, Our Lady of the Lake School, and Mt. Arlington Knolls Apartments sewage treatment plants (STPs). Discharge from the schools occurs only during school hours, and only during the school season. Loads contributed by these three plants were calcuated on only a nine month basis to properly account for vacation periods during which the schools are not operating. In our study, four-hour composites (10:00 am to 2:00 pm) were collected and analyzed for suspended solids, nutrients, and organics (Table 21). The annual point source loads contributed by each STP were calculated using the total nitrogen, total phosphorus and total suspended solids as measured in our study and the reported mean flows. These data were compared to data obtained in other studies (Table 22).

POINT SOURCE MONITORING DATA FOR SEWAGE TREATMENT PLANTS
DISCHARGING TO LAKE HOPATCONG TRIBUTARIES

Parameter	Consolidated School	Stanlick School	Lady of the Lake School	Mt. Arlington Knolls Apartments
NPDES No.	NJ0021156	NJ0021105	NJ026239	NJ0026212
Sampling Date	5-6-82	5-6-82	5-6-82	5-6-82
Mean Flow $m^3 \cdot day^{-1}$	4	9	4	85
Total Phosphorus $mg \cdot l^{-1}$	2.29	2.96	5.50	4.91
Ortho Phosphate $mg \cdot l^{-1}$	0.834	1.57	1.95	2.97
Total Kjeldahl Nitrogen $mg \cdot l^{-1}$	0.672	0.616	24.36	4.53
Nitrate Nitrogen $mg \cdot l^{-1}$	2.412	2.059	1.980	1.616
Ammonia Nitrogen $mg \cdot l^{-1}$	0.364	0.224	23.38	2.70
Organic Nitrogen $mg \cdot l^{-1}$	0.308	0.392	0.980	3.27
Total Organic Carbon $mg \cdot l^{-1}$	8.4	7.7	15.5	7.0
Total Suspended Solids	8.0	5.3	100.0	4.0

Table 22

POINT SOURCE LOADING TO LAKE HOPATCONG
AS MEASURED DURING DIFFERENT SAMPLING PROGRAMS

Sewage Treatment Plant	Load kg yr^{-1}								
	Total Phosphorus			Total Nitrogen			Total Suspended Solids		
	NES	5-29-80***	5-6-82	NES	5-29-80	5-6-82	NES	5-29-80	5-6-82
Consolidated School*	5.96	0.12	3.01	550.07	27.1	4.07	-	18.40	10.51
Arthur Stanlick School**	-	0.14	3.06	-	69.8	7.98	-	0	15.67
Our Lady of the Lake School	5	-	7.23	50	-	34.7	-	-	131.40
Mt. Arlington Knolls Apartments	185	-	152	550	-	192.4	-	-	124.1

*Flows from Consolidated School changed from NES estimate of 10.4 m^3d^{-1} to measured flow of 4 m^3d^{-1}.

**Adjusted to account for TP retention in Lake Shawnee.

***From Elam and Popoff, Wastewater Facilities Plan.

C. SAMPLING RESULTS

Note, the NES calculated TN and TP load reported for the Consolidated School has been modified (Table 22). In the NES report (USEPA, 1976; Appendix A), the mean flow computed for the Consolidated School is 104 m^3d^{-1} as opposed to actual measured mean flow of 4 m^3d^{-1}. The discrepancy results from the fact that the NES data was obtained by using an estimated daily flow of 0.3874 m^3/capita/day, the typical default value utilized for residential water use. The NES calculated flow is a gross overestimate, and is refuted by reports which show the plant to be operating at low flow conditions (Elam and Popoff, in prep), as well as measured flow data (NJDEP, 1979). Therefore, the load attributed to the Consolidated School in the NES report is an overestimate of the actual load discharged to Lake Hopatcong.

Of the four package plants, the effluent characteristics of the Our Lady of the Lake's plant are the poorest. Based on samples collected on 5/6/82, the concentrations of TKN, TP, TSS, TOC and NH_3-N are greater in the effluent of this plant than in the effluent of the other three plants. It is possible that on the date of sampling that the plant was in a state of upset, as sampling conducted on other dates reveal better effluent quality (USEPA, 1976; Elam and Popoff, in prep.). Closer monitoring of this plant is recommended as discharge of poor quality effluent into the lake will stimulate algal and macrophyte growth, particularly in the immediate vicinity of the discharge point.

This same point can be made relative to the concentration of TP in the effluent of all four plants. Note, that in all cases the concentration of TP in greater than 1 mg/l^{-1}. It is well established in the literature that a TP concentration in excess of 0.01 mg l^{-1} is sufficient to stimulate and sustain algal blooms in phosphorus limited systems.

D. POINT SOURCE LOADING TO LAKE HOPATCONG

Based on the data presented in Table 22, The annual point source load of TP to the lake is calculated to be 165.3 kg. This load accounts for nutrient retention by Lake Shawnee. Our data indicate that point source TP contributions to Lake Hopatcong amount to only 3.9% of the total annual TP load. Approximately 92% of the point source load is contributed by the Mt. Arlington Knolls Apartment STP.

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